WHAT IS CLAIMED IS:

1. A method for sputter coating a substrate in a sputter coating reactor, the method comprising:

a) providing a channel for gas to flow through, the channel defined by a channel defining surface wherein one or more portions of the channel-defining surface include at least one target material;

b) flowing gas through the channel wherein at least a portion of the gas is a non-laminarly flowing gas; and

c) generating a plasma, wherein the target material is sputtered off the channel-defining surface to form a gaseous mixture containing target atoms that is transported to the substrate.

2. The method of claim 1 wherein the non-laminarly flowing gas is formed by turbulence.

3. The method of claim 1 wherein the non-laminarly flowing gas is formed by flowing a first portion of gas in a first direction and a second portion of gas in a second direction wherein the first direction and the second direction are substantially non-parallel.

4. The method of claim 1 wherein the non-laminarly flowing gas is formed by flowing the gas through at least two orifices such that at least two gas streams emerging from the at least two orifices are flowing in substantially non-parallel directions.

5. The method of claim 1 wherein the non-laminarly flowing gas is formed flowing the gas through a series of orifices such that adjacent orifices direct the gas in non-parallel directions.

6. The method of claim 1 wherein the non-laminarly flowing gas is formed by turbulence with a Reynolds number greater than 2000.

7. The method of claim 1 wherein the channel-defining surface is part of a cathode.

8. The method of claim 1 wherein the channel has a rectangular cross section.

9. The method of claim 1 wherein the target material is in electrical contact with a DC potential, a DC potential with a superimposed AC potential, or a pulsed DC potential.

10. The method of claim 1 wherein the target material is in electrical contact with a pulsed DC power source that is an asymmetric bipolar pulsed DC power supply.

11. The method of claim 1 wherein the at least one target material comprises a metal or metal alloy.

12. The method of claim 1 wherein the at least one target material comprises a component selected from the group consisting of zinc, copper, aluminum, silicon, tin, indium, magnesium, titanium, chromium, molybdenum, nickel, yttrium, zirconium, niobium, cadmium, and mixtures thereof.

13. The method of claim 1 wherein the at least one target material includes a first target material and a second target material, the first target material being opposite the second and wherein the first target material and the second target material are the same or different.

14. The method of claim 13 wherein the first target material and the second target material comprise a metal or a metal alloy.

15. The method of claim 13 wherein the first target material and the second target material independently include a component selected from the group consisting of zinc, copper, aluminum, silicon, tin, indium, magnesium, titanium, chromium, molybdenum, nickel, yttrium, zirconium, niobium, cadmium, and mixtures thereof.

16. The method of claim 13 wherein the at least one target material includes a third target material and a fourth target material, the third target material being opposite the fourth target material and wherein the first target material, the second target material, the third target material, and the fourth target material are the same or different.

17. The method of claim 13 wherein the at least one target material includes a first electrically insulating block and a second electrically insulating block, the first insulating block being opposite the second insulating.

18. The method of claim 13 further comprising introducing a reactive gas into the sputter coating reactor.

19. The method of claim 18 wherein the reactive gas is introduced at a position located outside of the channel from which the gaseous mixture emerges.

20. The method of claim 18 wherein the reactive gas contains an atom selected from the group consisting of oxygen, nitrogen, selenium, sulfur, iodine, hydrogen, carbon, boron, and phosphorus.

21. The method of claim 18 wherein the reactive gas is selected from the group consisting of molecular oxygen, molecular nitrogen, molecular hydrogen, $H_2O$, $H_2Se$, $CH_4$, $C_2H_6$, $C_2H_2$, $C_2H_4$, $B_2H_6$, $PH_3$, $CCl_4$, $CF_4$, HMDSO, pyrrole and mixture thereof.

22. A method for depositing an oxide film on a substrate in a sputter coating reactor, the method comprising:

a) providing a channel for a working gas to flow through, the channel defined by a channel-defining surface wherein one or more portions of the channel-defining surface include at least one target material;

b) flowing the working gas through the channel wherein at least a portion of the working gas flows non-laminarly;

c) generating a plasma wherein a portion of the target material is sputtered off the at least one target material to form a gaseous mixture containing target atoms; and

d) introducing into the sputter coating reactor a reactive gas comprising oxygen, wherein an oxide film is deposited on the substrate.

23. The method of claim 22 wherein the reactive gas is introduced at a position located outside of the channel from which the gaseous mixture emerges.

24. The method of claim 22 wherein the at least one target material comprises a metal, metal alloy, or semiconductor.

25. The method of claim 22 wherein the at least one target material comprises a component selected from the group consisting of zinc, copper, aluminum, silicon, tin, indium, magnesium, titanium, chromium, molybdenum, nickel, yttrium, zirconium, niobium, cadmium, and mixtures thereof.

26. The method of claim 22 wherein the oxide film is $CrSiO_x$, ZnO:B (boron doped zinc oxide), $CuAlO_2$, $CuBO_2$, $In_2O_3$, $In_2O_3$:Mo, ITO, MgO, $Al_2O_3$ or mixtures thereof.

27. The method of claim 22 wherein the at least one target material comprises zinc and the oxide film is zinc oxide.

28. The method of claim 27 wherein the at least one target material further comprises aluminum.

29. The method of claim 22 wherein the reactive gas contains oxygen atoms.

30. The method of claim 22 wherein the reactive gas is molecular oxygen or $H_2O$.

31. The method of claim 22 wherein the at least one target material includes a first target material and a second target material; and the first target material and the second target material are the same or different.

32. The method of claim 31 wherein the first target material is opposite the second target material.

33. The method of claim 31 wherein the first target material and the second target material comprise a metal or a metal alloy.

34. The method of claim 31 wherein the first target material and the second target material independently comprise a component selected from the group consisting of zinc, copper, aluminum, silicon, tin, indium, magnesium, titanium, chromium, molybdenum, nickel, yttrium, zirconium, niobium, cadmium, and mixtures thereof.

35. The method of claim 31 wherein the first target material comprises zinc and the second target comprises aluminum wherein the oxide film is aluminum-doped zinc oxide.

36. A sputter-coating system for coating a substrate, the sputter-coating system comprising:

at least one target material

an electrode having a channel-defining surface wherein one or more portions of the channel-defining surface contains the at least one target material;

a source of non-laminarly flowing working gas; wherein during operation of the sputter-coating system a plasma is generated whereby the at least one target material is sputtered off the channel-defining surface to form a gaseous reactive composition that is transported to the substrate.

37. The sputter-coating system of claim 36 wherein the source of non-laminarly flowing gas includes a series of orifices such that at least two gas streams emerging from the series of orifices are substantially flowing in non-parallel directions.

38. The sputter-coating system of claim 36 wherein the source of non-laminarly flowing gas includes a series of orifices such adjacent orifice direct the gas in non-parallel directions.

39. The sputter-coating system of claim 36 wherein the enclosing surface is part of a cathode.

40. The sputter-coating system of claim 36 wherein the channel is characterized by a rectangular cross section.

41. The sputter-coating system of claim 36 wherein the at least one target material includes a first target material and a second target material, the first target material being opposite the second and wherein the first target material and the second target material are the same or different.

42. The sputter-coating system of claim 41 wherein the first target material and the second target material comprise a metal or a metal alloy.

43. The sputter-coating system of claim 41 wherein the first target material and the second target material individually include a component

selected from the group consisting of zinc, copper, aluminum, silicon, tin, indium, magnesium, titanium, chromium, molybdenum, nickel, yttrium, zirconium, niobium, cadmium, and mixtures thereof.

44. The sputter-coating system of claim 41 wherein the at least one target material includes a third target material and a fourth target material, the third target material being opposite the fourth target material and wherein the first target material, the second target material, the third target material, and the fourth target material are the same or different.

45. The sputter-coating system of claim 36 further comprising a source of a reactive gas.

46. The sputter-coating system of claim 45 wherein the source of a reactive gas is located at proximate position to the exit of the channel.

47. A method for depositing nitride film on a substrate in a sputter coating reactor, the method comprising:

a) providing a channel for a working gas to flow through, the channel defined by a channel-defining surface wherein one or more portions of the channel-defining surface include at least one target material;

b) flowing the working gas through the channel wherein at least a portion of the working gas flows non-laminarly;

c) generating a plasma wherein a portion of the target material is sputtered off the at least one target material to form a gaseous mixture containing target atoms; and

d) introducing into the sputter coating reactor a reactive gas comprising molecular nitrogen, wherein a nitride film is deposited on the substrate.

48. The method of claim 47 wherein the reactive gas is combined with the working gas while it is flowed through the channel.

49. The method of claim 47 wherein the reactive gas is introduced at a position located outside of the channel from which the gaseous mixture emerges.

50. The method of claim 47 wherein the at least one target material comprises a metal, metal alloy, or semiconductor.

51. The method of claim 47 wherein the at least one target material comprises a component selected from the group consisting of zinc, copper, aluminum, silicon, tin, indium, magnesium, titanium, chromium, molybdenum, nickel, yttrium, zirconium, niobium, cadmium, vanadium, hafnium, tungsten, and mixtures thereof.

52. The method of claim 47 wherein the nitride film is titanium nitride, indium nitride, aluminum nitride, chromium nitride, vanadium nitride, zirconium nitride, tungsten nitride, copper nitride, or mixtures thereof.

53. The method of claim 47 wherein the at least one target material includes a first target material and a second target material; and the first target material and the second target material are the same or different.

54. The method of claim 53 wherein the first target material is opposite the second target material.